ARCHAEOLOGICAL SURVEY OF THE KITTITAS VALLEY WIND POWER PROJECT, KITTITAS COUNTY, WASHINGTON

by

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INTRODUCTION

The Zilkha Renewable Energy Company contracted with Lithic Analysts of Pullman, Washington, to conduct an archaeological survey of the Kittitas Valley Wind Power Project (KVWPP) area in central Kittitas County, northwest of Ellensburg, Washington. This survey was conducted by Jeff Flenniken, Pam Trautman, and Josh Flenniken of Lithic Analysts in October of 2002. The weather was excellent and access to all areas was unobstructed.

The KVWPP area is located approximately 20 kilometers (~12 miles) northwest of Ellensburg, and 20 kilometers (~12 miles) southeast of Cle Elum. This project is located in Township19 North, Range 17 East, Sections 2, 3, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, and 27; and, Township 20 North, Range 17 East, Section 34 (Figure 1). The actual survey areas (areas affected by actual as well as potential ground-altering activities) were confined mainly to ridge tops, existing two track roads, paved roads, and existing power line rights-of-way (Figure 2).

On October 14, 2002, Lithic Analysts contacted, by letter, Johnson Meninick, Cultural Resources Director of the Yakama Nation, to inform him of the archaeological work to be conducted on the KVWPP. Prior to this letter, the Applicant contacted Mr. Meninick by telephone and certified mail inviting Yakama Nation participation in the cultural resources survey. A response from Mr. Meninick was not received. In addition, David Powell, Ceded Lands Archaeologist for the Yakama Nation, was also contacted by telephone to inform him of the archaeological work to be conducted on the KVWPP. Mr. Powell was invited to visit the project area during the archaeological survey, but declined.

VEGETATION

According to Franklin and Dyrness (1988:217), the KVWPP area lies within the *Artemisia* *tridentata/Agropyron spicatum* association of the shrub-steppe vegetation environmental zone. This zone occupies the center of the Columbia Basin Province and extends west to the foothills of the Cascade Range. Vegetation observed on the higher elevations of the project area includes desert buckwheat (*Erigonum*), dwarf goldenweed (*Haplopappus acaulis*), cushion phlox (*Phlox hoodii*), rock penstemon (*Penstemon gairdneri*) and low grasses. The higher elevations are situated within lithosols or regoliths, thus the sediments are extremely rocky. Vegetation observed on the lower elevations of the project area includes bitterbrush (*Purshia tridentata*) and arrow-leaf balsamroot (*Balsamorhize sagittata*) and various grasses. For a detailed discussion of the vegetation of the KVWPP area, see Section XX.

GEOLOGY

The Columbia River Basalt formation dominates the underlying geology of this project area. This formation was the result of an outpouring of a long sequence of Miocene lava flows covering an area of over 1,300,000 square kilometers (~500,000 square miles). Individual lava flows were 8 (~27 feet) to 30 (~100 feet) meters thick, with a total thickness of 600 (~2,000 feet) to 1,500 (~5,000 feet) meters (Franklin and Dyrness 1988:29). Interspersed between layers of basalt are interbeds of sedimentary deposits called the Ellensburg Formation. It is within these layers that opal, chalcedony, jasper, and chert are found. Prehistoric knappers utilized these lithic materials for flaked stone tool manufacture. Glaciers, 2,000,000 to 10,000 years ago, further carved the project area, helping to create the narrow, rocky ridges upon which the proposed wind turbines will be erected (Figure 1). For a detailed discussion concerning the geology of the KVWPP area, see Section XX.

HISTORY

Euroamerican influence in the Kittitas Valley began with early explorers such as Alexander Ross who traveled in areas to the east of the KVWPP area in 1814.Fur traders and trappers, both American and British, soon followed. For example, Charles Wilkes met with the Kittitas Indians near present-day Ellensburg in 1841 (Schuster 1998).

The Kittitas Valley, as part of the Oregon Territory, was governed under joint occupancy between the British and Americans until 1846. After that time Anglo settlements increased throughout the region.

The treaty between the United State Government and the Yakama Indian Nation establishing the Yakama Reservation, located south of the KVWPP area, was signed at Walla Walla, on June 9, 1855. Native American tribes, the Kittitas, Wanapum, Yakama, Taitnapam, and Klickitat, together ceded almost 4,400,000 hectares (~11 million acres) and were moved to the reservation at present-day Toppenish (Schuster 1998). The KVWPP area is located within the ceded territory of the Yakama Nation.

Specifically concerning the KVWPP area, the U.S. Department of Interior, General Land Office (GLO 1874), surveyed Township 19 North, Range 17 East in 1874. The surveyor noted a trail in the northeast corner of Section 22 and the eastern one-half of Section 16. Other surveyor comments included:

> Sections 14, 15, 22, and 23 – "land very broken and hilly: soil 3rd rate: bunch grass in abundance," and,
>
> Sections 10, 11, 14, and 15 – "land very broken and hilly: soil 3rd rate: fit only for stock grazing."

Township 20 North, Range 17 East, was surveyed much later in 1892 (GLO 1892). This survey reflected an increase in Euroamerican activities. Several roads were labeled as “wagon roads to timber” (GLO 1892). By then, the road from Ellensburg to Cle Elum was in place. This road crossed the eastern one-half of Section 34. Much later, this road came to be called State Highway 97. The surveyor reported “no timber or brush” near the southern section line of Section 34. For a detailed account of the history of the Kittitas Valley and the Yakama Indian Nation, see Schuster 1998, DePuyd 1990, Miller and Lentz 2002, and Historical Research Associates 1996.

ETHNOHISTORY

As mentioned above, the KVWPP area is situated within the Yakama Nation ceded territory. The Kittitas Indians are one of five closely related, but independent, bands that today make up the Yakama Nation. The Kittitas lived, generally, in the Yakima River valley drainage from Selah Creek (south of Ellensburg), north to the area near Keechelus Lake (at Snoquamie Pass). This area is often referred to as the Kittitas Valley. There were at least eleven known Kittitas villages in this portion of the Yakima River valley. Most of these villages were near the Yakima River, and the others were near creeks flowing into the Yakima River (Schuster 1998; Ray 1936). One Kittitas village was located at the mouth of Swauk Creek approximately 2 kilometers (1.2 mile) west of the KVWPP proposed turbine string B. Another was located approximately the same distance south of the KVWPP proposed turbine string C near the present settlement of Thorp. Ray (1936) also reported several Indian trails in the Kittitas Valley. One, in particular, followed Reecer Creek and crossed to Swauk Creek about four kilometers (2.5 miles) northeast of proposed turbine strings G and C in the KVWPP area. The ethnohistory of the Kittitas Indians, and the surrounding bands and villages of the Yakama Nation, has been well documented. For a detailed accounting of the ethnography of this area, consult Ray (1936), Schuster (1998), and Hunn (1998).

PREVIOUS ARCHAEOLOGICAL SURVEYS

A literature search of the recorded archaeological sites and other archaeological information was conducted at the Washington State Office of Archaeology and Historic Preservation (OAHP) in Olympia. All pertinent files concerning investigations of historic and prehistoric resources were reviewed for archaeological information regarding the immediate KVWPP area and the area surrounding the proposed site.

Very little archaeological research has been conducted in the upper Yakima River basin in Kittitas County. Except for those areas within the Bonneville Power Administration (BPA) power line rights-of-way, the KVWPP area has not been previously surveyed for cultural resources. In addition, according to the OAHP literature search, the KVWPP area does not contain previously recorded prehistoric or historic archaeological sites. However, portions of the surrounding area have been surveyed for cultural resources, and these surveys are detailed below.

In 1990, Eastern Washington University surveyed the Puget Sound Power and Light Intermountain Transmission Line between Hyak (King County) and Vantage (Kittitas County) (DePuyd 1990). This survey was located several kilometers south to southwest of the proposed KVWPP area along the southwest side of the Yakima River.

Archaeologists from Central Washington University conducted a random archaeological survey of 17 sections found on the Reecer Canyon Quadrangle (Bicchieri 1994). The Reecer Canyon Quadrangle area is situated directly east of the Swauk Prairie Quadrangle on which the proposed KVWPP is located.

A portion of State Highway 97 north from Section 27, Township 20 North, Range 17 East, was surveyed in 1994 by Eastern Washington University archaeologists at selected Washington State Department of Transportation locations (Holstine and Gough 1994). This highway survey commenced about a 3 km (~2 miles) northwest of a portion of the KVWPP area located in Section 34 where the G turbine string is proposed (Figure 1).

Archaeologists from Historical Research Associates, Inc. (HRA, Inc.) surveyed the Olympic Pipeline's proposed Cross Cascades Petroleum Products Pipeline for Dames and Moore in 1996 (HRA, Inc. 1996). This survey was conducted for a proposed 382 km (~235 miles) underground pipeline to carry petroleum products from western Washington to storage facilities near Ellensburg and Pasco. HRA, Inc. recorded numerous prehistoric and historic archaeological sites, but none of these recorded archaeological sites are within the proposed KVWPP .

HRA, Inc. archaeologists conducted another survey in 1998 for the BPA's proposed Seattle-to-Spokane Fiber Optic Cable Project (Thompson 1998). One BPA steel tower transmission line bisects the proposed KVWPP area at turbine strings H (Sec. 2, T19N, R17E) and G (Sec. 34, T20N, R17E: Figure 1). Most of the cable was installed on existing transmission towers, although the cable was buried in six locations throughout the right-of-way. The closest location to the KVWPP area was the Schultz Substation in Section 15, T19N, R18E, Reecer Canyon Quadrangle, several kilometers to the southeast of the KVWPP area.

As discussed above, historic and/or prehistoric archaeological sites were not previously recorded within the KVWPP area. However, there are archaeological sites recorded within the surrounding KVWPP area.

PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES

As mentioned above, previously recorded historic or prehistoric archaeological sites within the KVWPP area were not found during the OAHP literature search or during the few archaeological surveys conducted in and around the KVWPP area. However, there are eight recorded sites (5 prehistoric and 3 historic) within 2 kilometers (~1.2 miles) of the KVWPP area. They include:

45KT350, Section 27, T20N, R17E, Swauk Prairie Quadrangle – prehistoric
45KT368, Section 5, T19N, R17E, Swauk Prairie Quadrangle – historic
45KT545, Section 2, T18N, R17E, Swauk Prairie Quadrangle – prehistoric
45KT1754, Section 24, T19N, R17E, Thorp Quadrangle – prehistoric
45KT2182, Section 20, T19N, R17E, Thorp Quadrangle – prehistoric
45KT2183, Section 38, T19N, R17E, Thorp Quadrangle – prehistoric
223, Kittitas County, Section 20, T19N, R17E, Swauk Prairie Quadrangle - historic
224, Kittitas County, Section 20, T19N, R17E, Thorp Quadrangle - historic

In addition, the southern portions of the KVWPP turbine strings B and C are situated on ridges under which lies a tunnel for the North Branch Canal (Figure 1). This canal is a branch of the Kittitas Reclamation District Main Canal irrigation system, constructed between 1926 and 1932. The water intake is on the south bank of the Yakima River just above Easton. The water from this canal irrigates approximately 1,132 hectares (~2,830 acres) in the vicinity of Badger Pocket southeast of Ellensburg. The OAHP inventoried this irrigation system in 1985 (Soderberg 1985).

SURVEY METHODS

This project differed from most archaeological surveys in that the areas affected by ground-altering activities will be linear in nature, not large surface parcels (Figure 1). All affected areas were walked in meandering transects by three surface investigators (Figure 2). Ground visibility was excellent in almost all areas of this project. Only a few very short lengths of transects were covered by thick grass.

All wind turbine generator strings (A, B, C, D, E, F, G, H, I and J: Figure 1) were covered by three meandering transects each at 30 m (~100 feet) intervals (Figure 2). All existing access roads, new access roads, underground electrical lines, and overhead electrical lines (Figure 1) were investigated by 10 m (~35 feet) meandering transects (Figure 2). The areas proposed for the project substations (Figure 1) were surveyed by 10 m (~35 feet) meandering transects also (Figure 2).

SURVEY RESULTS

The KVWPP area northwest of Ellensburg is interesting in that a blue chalcedony, found eroding out of the Ellensburg Formation, occurs locally. These blue chalcedonies are know to the local rock hounds as “Ellensburg Blues” and are very expensive when cut and polished for jewelry “gem stones.” This is mentioned because almost every potential chalcedony-bearing rock visible on the surface had been smashed by a metal hammer. The contact point on these rocks still contained metal from the hammer’s blow. Most rock hounds in the area apparently do not know the difference between quartz and chalcedony, and therefore, smashing the rocks gives the rock hound a view of the rock’s interior. According to local residents, this method of “Ellensburg Blue” hunting has been practiced in this region for at least 70 years (Fennelle Miller, personal communication). This rock hounding activity has not only created “historic” debitage on the surface of every ridge in the project area, but these rock hounds also were avid Indian artifact collectors. As a result of 70 years of rock hounding activities, prehistoric and historic artifacts are virtually non-existent. What few flakes were located were possibly a result of prehistoric prospecting for flintknapping material). It was difficult to determine their antiquity given the recent “flaking” activity that has occurred in the KVWPP area. Only two prehistoric sites were located and recorded during this archaeological survey (Appendix A). Both of these sites were in poor condition and provided only minimal lithic technological information.

Site Analysis Methods

Artifacts from the two KVWPP sites were analyzed and recorded infield, on-site, during the investigation of each site (Appendix B). The artifacts were replaced to their original surface locations. During these analyses, artifacts were not collected from these sites as the Applicant will avoid both sites during construction and/or ground-altering activities. This analytical method was adopted over the more traditional “surface collection and curation” method for four reasons: 1) by analyzing the surface artifacts infield, on-site, the same technological information was recovered as with the “collection” method, but the integrity of the surface assemblages of these sites remain undisturbed by archaeological investigations; 2) if other researchers want to re-analyze the flaked stone reduction technology at these sites, they will have access to the same artifacts as well as identical field-laboratory “context” conditions as this study; 3) modern repository curation constraints are nonexistent as the artifacts remain on-site and in archaeological context; and, 4) Native American (Yakama Nation) concerns about removing artifacts from sites are non-existent.

Technological lithic analysis based upon replicative data was conducted for all flaked stone artifacts identified on the surfaces of these two sites (Appendix A). Technological identifications were determined for all flaked stone artifacts. Lithic artifacts were also examined on the basis of raw materials and reduction stage categories (Appendices C and D). Reduction stage flake categories were defined by comparing technological attributes of replicated artifacts from known and cataloged flaked stone tool reduction technologies to the prehistoric controls. In turn, by comparing the technological attributes of prehistoric artifacts (controls) to the technological attributes of known artifacts in terms of manufacture, reduction stages were assigned to technologically diagnostic debitage. Some debitage, however, was considered technologically nondiagnostic due to the lack of technological attributes (e.g., platforms) on fragmentary pieces.

Toolstone Materials

The prehistoric occupants of these KVWPP sites employed toolstones that were readily available on or near these sites (Appendix B). Local toolstone materials included chalcedony, chert/jasper, quartzite, and opal. Obsidian, as a toolstone, is considered non-local. Chalcedony is, by far, the most commonly occurring toolstone material found on these sites.

Once the lithic materials were selected for use by prehistoric knappers, they were reduced where they were collected or transported to a location where they were reduced. Chalcedony, chert, and jasper (and some quartzites) materials required heat treatment to improve flakeability prior to complete reduction into tools. The artifacts identified on these two KVWPP sites did not appear to be heat treated, however.

Technological Analyses of Sites

KVWPP Site #1

KVWPP Site #1 is located (0674647 m E/5227390 m N) at the north end and to the east of turbine string G, just west of a seep (Figures 1 and 2: Appendix A). This lithic debitage dominated site (LDDS) measures approximately 30 m north/south by 50 m east/west, and contained 18 artifacts of chalcedony (n=9), chert (n=5), jasper (n=2), quartzite (n=1), and opal (n=1). Six technologically diagnostic flakes (Appendix D) were identified. Five of these artifacts were Stage 1, core reduction, flakes. They included one jasper primary decortication flake with incipient cone cortex (101.PI), one chalcedony secondary decortication flake with primary geological cortex (110.SP), one jasper secondary decortication flake with incipient cone cortex (111.SI), and two early interior flakes with single facet platforms (122.IS). One Stage 3, percussion bifacial thinning, flake, a chert early bifacial thinning flake (302.E-), was also identified.

Technologically nondiagnostic flake fragments (Appendix D) included six fragments with primary geological cortex ([997.NP] three chalcedony, two chert, and one opal) and four chalcedony fragments without cortex (999.NN). These flake fragments were large and evenly spread over the entire site area.

Formed artifacts consisted of one tested quartzite cobble (2.RM-Test) and one fragment of a chert flake blank (12.B-FragDS). The debitage associated with the tested quartzite cobble was still present on site. Possibly, more formed artifacts, as well as debitage, were affiliated with this site, but may have been removed by relic collectors.

Based upon this meager flaked stone assemblage identified at this LDDS, prehistoric knappers selected chalcedony, chert, jasper, and opal nodules, and removed at least some of the cortex from those nodules at this location. In addition, at least one chert biface was partially thinned at this site.

KVWPP Site #1, given it's location near water, may have been a lithic scatter (Appendix B).

If ground stone artifacts were present on this site in the past, they had been removed by relic collectors. Furthermore, sedimentologically, this site is situated within a lithosol or regolith. Therefore, the sediments are extremely rocky. Subsurface cultural deposits are not likely to exist at this location.

KVWPP Site #2

This LDDS is located (0674364 m E/5222639 m N) just west of the proposed BPA substation location and just north of the BPA power line right-of-way (Figures 1 and 2: Appendix A). This site is a small debitage concentration, approximately 1.5 m (~5 feet) in diameter, of, at least, six different nodules including chalcedony, opal, and opalized wood, all with primary geological cortex. Because of the amount of in situ (surface as well as partially buried) debitage (three interior flakes with single facet platforms [122.IS] and hundreds of small flakes and flake fragments), this site was determined to be a prehistoric location of initial toolstone nodule reduction as opposed to a modern rock hound's pile resulting from Ellensburg Blue hunting. The hundreds of small flakes and flake fragments were not disturbed, identified, recorded, and counted because the integrity of the site would have been compromised.

KVWPP Site #2 is approximately 1.5 m (~5 feet) in diameter and is classified as a segregated reduction location most likely representing a single prehistoric flintknapping event (Appendix B). Formed artifacts were not found at this location and were likely transported away from the site by the original knapper.

The boundaries of both KVWPP sites were marked with red/black flagging tape. The site centers were identified by orange pin flags with orange plastic tags complete with the site numbers (#1 and #2).

SUMMARY AND RECOMMENDATIONS

This archaeological survey project covered the entire areas within the KVWPP where ground-altering activities potentially may occur (Figures 1 and 2). Two small prehistoric LDDSs were identified (Appendix A). The KVWPP area is also the location of intensive rock hounding activities.

It is recommended that both prehistoric archaeological sites be avoided to prevent any damage to either site. If prehistoric or historic artifacts are encountered during ground-altering activities, work associated with those ground-altering activities should be halted immediately and a professional archaeologist should be notified immediately to inspect the artifacts and their subsurface context(s).

It is also recommended that copies of this report be forwarded to the Yakama Nation Cultural Resources Director, Johnson Meninick, and to the Washington State Office of Archaeology and Historic Preservation in Olympia.

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APPENDIX A: KVWPP SITE FORMS

APPENDIX B: TECHNOLOGICAL ANALYSIS

TECHNOLOGICAL ANALYSIS

Technological debitage analysis based upon replicative data (cf. Flenniken 1981) was selected over other analytical methods to obtain processual reduction stage identifications. Methods such as size-grading (cf. Ahler 1989) or morphological attribute (length, width, thickness, weight, or completeness of flake) analyses (cf. Sullivan and Rozen 1985) do not allow processual anthropological modeling of specific technological activities. Analyses dependent on metric data provide the analyst with size-descriptive information only, they do not allow reliable identification of prehistoric behaviors. Metric analyses do not take into account crucial variables such as raw material type, quality, shape, and flakeability; nor do they consider the skill level of the prehistoric knapper, the reduction sequence(s), or the intended end product(s).

Size-grading of debitage, often presented as a variety of technological analysis, is also ineffectual as a means of providing accurate prehistoric lithic technological information (cf. Scott 1985, 1990, 1991). In one case where samples of debitage from six different sites were subjected to both size-grading analyses and technological analyses in an effort to define the lithic reduction activities that occurred at each site, Scott (1985:69) found ". . . size-grading artificially separates debitage into classes that do not accurately reflect lithic reduction."

Ahler's (1989) work concerning size-grading analysis or "mass analysis of flaking debris" is the most comprehensive size-grading study to date. However, even using experimental controls, size-grading analysis proves inadequate for making inferences as to the reduction process due to the qualifications placed on interpretive comparisons. For example, Ahler's (1989) reduction modeling does not apply to multiple-material sites where the size, shape, and quality of the original raw materials may have influenced reduction strategies. Multiple flaking episodes are said to require interpretation through multi-variate statistical analysis even though statistics are not capable of interpreting data. Ahler's approach provides little or no accurate technological information concerning lithic reduction techniques because of inherent methodological errors regarding scientific experimental procedure. Reasoned sampling of large assemblages combined with technological attribute and stage analysis is more informative than are low-level descriptions of complete, large assemblages.

Replicative Systems Analysis is a methodological concept designed to understand the behavior prehistorically applied to flaked stone artifacts (Flenniken 1981). The method involves replicating, through flintknapping experimentation, a hypothesized (based upon debitage frequencies documented during analysis) sequence of lithic reduction employed at a particular archaeological site. By comparing the prehistoric debitage with cataloged experimental debitage, it is possible to determine the reduction techniques and sequence(s) employed at a given site by prehistoric knappers. Experimentation has also demonstrated that many by-products associated with tool manufacture can be mistaken for functional tools (cf. Flenniken and Haggarty 1979).

The Replicative Systems Analysis approach offers a reliable means to both identify and demonstrate the method(s) by which prehistoric knappers reduced available stone into flaked stone tools and weapons. Because flintknapping techniques are learned rather than innate behavior, reduction strategies can be both culturally and temporally diagnostic (Flenniken 1985; Flenniken and Stanfill 1980). Thus, by studying the reduction technologies employed at archaeological sites, it is possible, once the technological foundation based upon numerous technological analyses has been established, to correlate sites in time and space by identifying related or similar lithic technologies (cf. Flenniken and Stanfill 1980). The correlations may aid future research involving descriptions of regional mosaics of human activity patterns as they vary through time. In regions where volcanic or acidic sediments preserve very little of the archaeological record except stone artifacts, or where prehistoric activities left little or no traces, this method of gathering information can be extremely productive. This approach to lithic analysis is useful and appropriate because it focuses on determining what lithic technologies were used at a particular site, how these technologies may have changed through time, and whether these changes correlate to specific time periods.

Attributes evidenced on the prehistoric debitage, in conjunction with experimental analogs, were used to identify technologically diagnostic debitage which enabled flakes to be assigned to specific experimentally derived reduction stages (cf. Flenniken 1978, 1981). The remaining debitage was not ascribed to any reduction stage because of the fragmentary nature of the specimens. Therefore, it was characterized as technologically nondiagnostic, although attributes such as material type and presence/absence and type of cortex were noted.

Each site was analyzed and recorded as a separate entity. Surface artifacts (both debitage and formed artifacts) identified from the investigations of these two sites were analyzed and assigned to specific technological categories, or "tecats" (Appendix D). Technologically diagnostic flakes are typically those that retain platforms and are complete enough to exhibit dorsal flake scar attributes; these portions exhibit many attributes that are informative about reduction technology. The remaining flake fragments were not ascribed to any reduction stage because of the fragmentary nature of the specimens, and were characterized as technologically nondiagnostic debitage (995.PL through 999.NN). Flake attributes such as material type, heat treatment, and presence/absence and type of cortex were noted for all technologically diagnostic artifacts. Technologically diagnostic debitage was assigned to specific reduction categories (e.g., 100.PP, 113.SS, 122.IS, 302.E-, etc.);

this portion of the debitage served as the basis for interpretation of site activities. These samples of the technologically diagnostic debitage were separated from the nondiagnostic debitage. Formed artifacts (i.e., technological categories [tecat], 1.RM-Unalt through 1023.AB) were also included in these technological analyses (Appendix D).

Debitage classification attributes were divided into four technological categories that reflect variation in reduction strategies and reduction stages. The four reduction-oriented technological stages are: 1) **core reduction**, that is, primary decortication debitage identified on the basis of 100% cortex on the dorsal surface and platform configuration, secondary decortication debitage separated based upon partial dorsal cortex and platform type, and interior debitage categorized by platform attributes, dorsal arris count and direction, flake cross/long-section configurations, and especially, absence of dorsal cortex; 2) **edge preparation**, that is, bifacial reduction debitage classified on the basis of multifaceted platform configuration and location, location of remnant bulb of force, dorsal arris count and direction, flake termination, flake cross/long-section orientations, and presence or absence of detachment scar; 3) **percussion bifacial thinning**, that is, debitage segregated on the basis of multifaceted platform configuration, size, lipping, and location, dorsal arris count and direction, flake termination, cross/long-section orientations, and presence or absence of detachment scar; and, 4) **pressure bifacial thinning**, that is, debitage separated on the basis of multifaceted platform configuration and location, dorsal arris count and direction, flake termination, platform-to-long axis geometry, cross/long-section orientations, and presence or absence of detachment scar. Nondiagnostic fragments, potlids (995.PL), bipolar shatter (996.SH), and flake fragments, with cortex (including type [997.NP and 998.NI]) or without cortex (999.NN) were also counted. Interpretation of the reduction sequence(s) for this study considered only the technologically diagnostic artifacts.

Diagnostic debitage was separated into reduction stages on the basis of technological attributes exhibited by each artifact. As described above and defined in Appendix D, Stage 1; (**core reduction**) technological debitage categories was identified as 100.PP through 150.BP; Stage 2 (**edge preparation**), 200.B+ through 204.E+; Stage 3 (**percussion bifacial thinning**), 300.M- through 305.L+; and; Stage 4 (**pressure bifacial thinning**), 400.E- through 409.LT. The stages described for the assemblage from each site are specific and may not be directly applicable to other site assemblages because of potential temporal differences in lithic reduction technologies.

Site Classifications

Assemblage scale patterns--the proportions of flakes each, various in debitage categories--can be used to infer the reduction activities that occurred at a location and, in turn, the sum of these activities can be interpreted to classify a site's function in the context of a prehistoric settlement system. It is recognized that archaeological assemblages are often the products of complex natural and cultural site formation processes, and patterning in assemblages is conditioned by the unique history of human activity at a particular location on the landscape. A site's function may change during successive occupations or diverse activities may occur during single occupations. While recognizing these limitations, it is thought that it can still be useful to classify *lithic debitage dominated sites* (LDDS) into functional types. Six LDDS categories were considered for these analyses and these are thought to accurately describe the range of variation seen in sites dominated by lithic artifacts. Site function categories are defined below in terms of the assemblage patterns expected for them and the kinds of activities suggested by these patterns:

1) PROSPECT SITE (Wilke and Schroth 1989). This type of LDDS is directly associated with surface-exposed lithic toolstone. Material may be pebble, cobble, or boulder size, and exist as

surface "float" (lithic pavements). Debitage may represent numerous diachronic knapping events. The reduction technology(s) present on these sites are difficult to define as most of the debitage will represent material testing for quality. Debitage will be predominately primary and secondary decortication flakes (Stage 1, core reduction) representing the very beginning of core preparation reduction. Formed artifacts are limited to tested or assayed parent raw materials.

Prospect sites are usually limited in size to the availability of surface toolstone. However, if surface toolstone materials were readily available over a very large area, prospect sites may be extremely large given diachronic exploitation.

2) QUARRY SITE. Quarry sites are frequently associated with bedrock toolstone and, to a lesser extent, float material. Shallow or deep "quarry pits" may be visible as a result of prehistoric exposure of subsurface toolstone materials. The majority of the technologically diagnostic debitage at quarry sites will include primary and secondary decortication flakes, interior flakes (Stage 1, core reduction), and a *very* low percentage of early biface thinning flakes (Stage 3, percussion bifacial thinning), and may represent numerous diachronic knapping events. Formed artifacts associated with these sites are broken and/or low quality quarry blanks (flake blanks, bifacial blanks) and/or cores (single facet platform, multifacet platform, multidirectional, etc.).

Quarry sites are similar to prospect sites in that quarry sites usually are limited in size by the availability of toolstone. However, if subsurface toolstone materials were "available" by excavation over a very large area, quarry sites may be extremely large given diachronic exploitation of the toolstone.

3) WORKSHOP SITE. These sites are "associated" with toolstone source areas, but not necessarily directly associated with source materials. In other words, workshops sites are somewhat close but not at the toolstone source location. Numerous diachronic knapping events will be reflected by technologically diagnostic debitage representing one or more reduction sequences identifiable by decortication flakes, interior flakes, and bifacial thinning flakes (Stages 1-4). Large quantities of debitage may result in the presence of small talus slopes and/or mounds. Formed artifacts will include rejected tools due to manufacturing errors and low quality "tools" of various stages of production.

Workshop site size is usually restricted to one small location. Site restrictions are governed by such attributes as view, proximity to water, fuel, and transportation routes (trails), and distance from the source area.

4) SEGREGATED REDUCTION LOCATION (Flenniken and Stanfill 1980). Segregated Reduction Locations (SRL) sites are frequently associated with float materials that occur on lithic or desert pavements. These sites are small, discrete concentrations of technologically diagnostic debitage that represents a single knapping event. Debitage will be restricted to one reduction sequence (Stages 1-4) or a portion of one reduction sequence. Multiple flaked stone reduction sequences will not be associated in one SRL. Formed artifacts found at SRLs will include one or several broken stage diagnostic artifacts.

The size of an SRL varies depending upon the number of associated SRLs. If one SRL is isolated, it will be a very small, approximately 1-3 m in diameter. SRLs may overlap creating a larger area of debitage concentrations. SRLs are not associated with any specific locational attribute.

SRLs and prospect sites differ in that prospect sites are directly associated with the toolstone source, SRLs may not be associated with a toolstone source. Prospect sites contain limited technologically diagnostic debitage (decortication flakes), SRLs will frequently contain entire reduction sequences (both debitage and broken formed artifacts). SRLs are single, discrete, synchronic knapping events, prospect sites are numerous diachronic knapping events.

5) CHIPPING STATION SITE. This LDDS type is not directly associated with a toolstone resource area, and represents numerous synchronic knapping events involving the same flaked stone reduction technology. Debitage mounds and/or talus slopes are not present. The technologically diagnostic debitage will support one entire reduction sequence (Stages 1-4) or any single stage of reduction. Formed artifacts will include numerous broken and/or low quality stage diagnostic artifacts.

Chipping station sites are frequently rather small, but the debitage is concentrated in one area. Site attributes may be related to view, proximity to water, fuel, and trails.

6) LITHIC SCATTER SITE. Lithic scatter sites are not associated with a toolstone resource area and may include numerous diachronic knapping events representing potentially a variety of flaked stone reduction sequences with differing end products. Technologically diagnostic debitage will include one or more entire reductions sequences (Stages 1-4, of several different reduction sequences) and/or single stages from different reduction sequences. Formed artifacts will include broken and/or low quality stage diagnostic artifacts as well as "spent" or broken projectile points.

Lithic scatters potentially are associated with other resource exploitation artifacts such as metates, manos, battered implements, scant faunal remains, fire hearths, and fire-cracked rock. Lithic scatters are directly associated with water, seasonal or permanent, vary in size from very small to literally hundreds of meters in length, and are frequently located in areas sheltered from the weather.

Toolstone Materials

The prehistoric occupants of these KVWPP sites employed toolstones that were readily available on or near these sites. Local toolstone materials included chalcedony, chert/jasper, quartzite, and opal. Obsidian, as a toolstone, is considered non-local. Chalcedony is, by far, the most commonly occurring toolstone material found on these sites.

Chalcedony is well represented in the form of artifacts at both of these sites. Chalcedony is a translucent, fibrous microcrystalline variety of quartz with a waxy luster. Chalcedony ranges in color from clear to white, red, brown, and black. The colored varieties of chalcedony are frequently called agates. Often the clear varieties have dark inclusions in the form of lines or plant-like impressions called dendrites. Chalcedony is composed of microcrystalline sheaf-like bundles of radiating fibers and is deposited from aqueous solutions which are found lining or filling cavities in other rocks (Chesterman 1995; Klein and Hurlburt 1985; Luedtke 1985; Pellant 1995).

Chert/jasper is an opaque form of microcrystalline quartz composed of numerous grains that form a granular crystalline structure. Chert and jasper are chemically precipitated sedimentary rocks which are classed as microcrystalline but may contain sheaf-like aggregates which may include impurities such as clays, silts, carbonates, pyrites, iron, or other organic materials. Chert and jasper also may contain several forms of silica such as opal, chalcedony, or cryptocrystalline quartz. Cherts range in color from white to light gray to black. Jasper, because of its iron content, is red, yellow, or brown. Green jasper is called prase or chyrsoprase. Jasper is distinguished from chert on the basis of color (Chesterman 1995; Klein and Hurlburt 1985; Luedtke 1985; Pellant 1995).

Quartz is one of the most common lithic materials and occurs in a wide variety of hexagonal prisms which are terminated by pyramidal shapes. It also occurs in massive, granular, concretionary, stalactitic, and cryptocrystalline habits. When combined with other materials, quartz or metaquartzite is referred to as quartzite where as a single crystal is called monocrystalline quartz. Colors ranges from white, red, grey, purple, yellow, brown pink, black, green, as well as colorless. Quartz is transparent to translucent with some forms occurring as opaque (i.e., quartzite). Quartz has a hardness of 7, a specific gravity of 2.65, and fractures conchoidally (Chesterman 1995; Klein and Hurlburt 1985; Luedtke 1992; Pellant 1995).

Opal has an amorphous, non-crystalline structure, and forms in a great variety of geological environments. Common opal is gray, black, green, and white, and may be transparent to opaque. Common opal forms at low temperatures from silica-rich water, mainly hot springs, and is found through the Pacific Northwest (Chesterman 1995; Klein and Hurlburt 1985; Luedtke 1992; Pellant 1995).

Once the lithic materials were selected for use by prehistoric knappers, they were reduced where they were collected or transported to a location where they were reduced. Chalcedony, chert, and jasper (and some quartzites) materials required heat treatment to improve flakeability prior to complete reduction into tools. The artifacts identified on these two KVWPP sites did not appear to be heat treated, however.

APPENDIX C: GLOSSARY OF TERMS
GLOSSARY OF TERMS

Abrader: Friable lithic material (commonly sandstone or pumice) used to grind or abrade an edge in platform preparation for flake removal in flintknapping, or to wear-down, by friction, any bone, antler, or wood artifact.

Alternate flake: Flake that is much wider than it is long, triangular in cross-section, and produced as a result of the creation of a bifacial edge from a square or broken edge on a given piece of stone; "turning-the-edge" of a piece of stone.

Anvil: Rest or support used in bipolar as well as other lithic reduction techniques.

Arris: Ridge on the dorsal surface of a flake.

Arrow point: Barbed projectile point that functioned as a tip on an arrow propelled by a bow.

Bending fracture: Tension/compression fracture that commonly results from impact during use of projectile points, from end shock during percussion bifacial reduction, from stresses applied to support thin preforms during pressure bifacial reduction, and from trampling. Bending fractures can be distinguished from conchoidal fractures by their absence of ring cracks and bulbs of force. Bending fractures initiate at a flaw in the stone, propagate at an angle nearly perpendicular to the surface, and generally terminate in a fragile extension that curves sharply away from the propagation angle. Bending flakes are generally lipped at the initiation point and "waisted" near the proximal end. For a detailed discussion see The Formation of Flakes by Brian Cotterell and Johan Kamminga, 1987, *American Antiquity* 52(4):675-708.

Biface: Lithic material flaked on both of two faces or surfaces.

Bifacial blank: Biface made from a flake blank or core nucleus by direct free hand percussion. These blanks can be further reduced into a variety of bifacial artifacts.

Bipolar core: Core produced by placing a piece of lithic material on an anvil and striking the material with a hammerstone. Flakes may be produced from the hammerstone and/or the anvil end of the core.

Bipolar flake: Compression flake produced from the reduction of a bipolar core.

Blade: Specialized flake with parallel lateral margins, associated with a prepared core technology.

Block core: Large, angular, *stationary* raw lithic material from which flakes are removed by direct free hand percussion.

Block-on-block technique: A flintknapping technique where the knapper uses a heavy hammerstone to strike stationary toolstone usually imbedded in the ground. This technique was frequently used in quarrying toolstone material. The hammerstone may also have been thrown onto the stationary toolstone to free the material or break-down the material.

Bulb removal flake: Percussion thinning flake removed from the proximal (platform) end of the ventral surface of a flake blank. This flake removes the contact point, cone, and most of the bulb of percussion from the parent flake blank. On a complete bulb removal flake, a cone of force is present on both the ventral and dorsal flake surfaces.

Chipping station: Area on, near, or forming an archaeological site where artifacts were produced systematically by flintknapping. Chipping stations exhibit debitage from multiple synchronous events or multiple events through time.

Complete: Lithic artifact that retains technologically (stage of reduction) diagnostic attributes.

Conical flake core: Single platform flake core from which flakes are removed by percussion in a single direction. Exhausted core is cone-shaped.

Core flake blank: Large flake from which a flake core is produced.

Cortex: Outer weathered rind on lithic material or naturally occurring rind on the outside of lithic material. Cortex may be primary geological cortex (remnants of contact with formation matrix or weathered at or near its outcrop) or incipient cone cortex (water transported).

Dart point: Barbed projectile point that functioned as the tip on a dart propelled by an atlatl.

Debitage: Flakes derived as a product or byproduct of flintknapping reduction sequence or trajectory.

Detachment scar: When a flake is produced, the ventral surface of that flake is its detachment scar. Remnants of the detachment scar are used in analysis to identify artifacts manufactured from flake blanks.

Distal: Tip of a projectile point or the termination end of a flake.

Dorsal: Surface of a flake corresponding to the exterior of the artifact from which it was detached.

Early stage interior flake: Flakes with few parallel arrises and no cortex on their dorsal surfaces. Flakes from the interior of the parent stone or core. Frequently associated with flake blank production from flake cores.

Early stage bifacial thinning flake: Percussion flake removed from a biface during reduction for the purpose of increasing width-to-thickness ratio while maintaining symmetry. These flakes have few dorsal surface scars, are slightly curved in long-section, and generally have multifaceted, abraded platforms.

Early stage pressure flakes: First series of pressure flakes removed from a biface. These flakes have multiple irregular scars on their dorsal surfaces, are twisted in long-section, are small relative to percussion thinning flakes, and their platforms form an oblique angle with the long-axis of the flake. These flakes are produced as a result of regularizing the biface by pressure reduction.

Edge preparation flake: Flake removed from the edge of a flake blank or bifacial blank in order to ready margins for further reduction by changing the platform angle. Flakes are triangular in long-section and usually wider than they are long. The original detachment scar is visible on the distal end of the dorsal surface of flakes produced in edge preparation of flake blanks.

End shock: Occurrence of a bending fracture produced as a result of excessive percussion (dynamic) loading force causing flexion beyond the elastic capacity of a stone. End shock generally occurs during the late stages of bifacial thinning when shock waves from a percussion blow cause one end of the biface to snap.

Eraillure flake: an enigmatic flake formed on the positive bulb or cone of force and in between the positive and negative bulbs of force. Large eraillure flakes are created during the removal of large flakes.

Exhausted: Stone tool or artifact discarded because it is spent, used up, or worn-out.

Exhausted raw material: Piece of lithic material usually exhibiting multiple flake removal scars. This term refers to a core that has reached the end of its use-life as a result of reduction in size and/or because of checks or flaws.

Flake blank: Large flake that is intended for reduction into a bifacial blank or other tool. Unmodified flake blanks are indistinguishable from other debitage in most archaeological contexts. The identification of remnant original detachment scars in an assemblage, however, attests to the corporeality of this reduction stage.

Flake core: Lithic material that serves as a parent piece for flake removal. Flake cores may include conical cores, bifacial cores, and multidirectional cores.

Flake tool: Flake with intentionally altered, polished and/or dulled edge resulting from use (not to be confused with platform preparation).

Float: Geological context of some obsidian source areas. The product of weathering of rhyolitic volcanic domes in which nodules of resistant obsidian are left on the surface (See *Obsidian Studies in Oregon* by Craig E. Skinner, University of Oregon MA thesis, 1983). The cortex formed on obsidian float nodules has a wrinkled, vesicular, or pitted appearance. Also, other materials such as chert, chalcedony, and quartzite can occur on the landscape as float in the form of gravel.

Fragment: Lithic artifact that is a portion of the original or functioning artifact. Fragments may be identifiable as to technological category if diagnostic attributes are still present.

Interior flake: Flakes that do not possess cortex on their dorsal surfaces. Flakes from the interior of the parent stone or core.

Lanceolate point: Barbless projectile point that functioned as the tip on a thrusting spear.

Late stage interior flake: Flakes with numerous parallel arrises and no cortex on their dorsal surfaces. Flakes from the interior of the parent stone or core. Last flakes removed from a artifact before bifacial thinning begins.

Late stage bifacial thinning flake: Flakes produced during the final stages of percussion biface reduction for the purpose of increasing width-to-thickness ratio. These flakes have numerous scars on their dorsal surfaces, are almost flat in long-section, usually exhibit feather termination, and have multifaceted platforms.

Late stage pressure flake: Flakes produced during the final pressure flaking episodes. They are small, parallel-sided, have one dorsal arris, are slightly twisted in long-section, and have multifaceted, abraded platforms.

Linear shatter: Angular and elongated pieces of stone that lack cortex and a platform, and are frequently square in cross-section. Linear shatter frequently results from block-on-block quarrying of bedrock materials.

Margin removal flake: Semicircular fragment of a bifacial edge produced as a result of a bending fracture, commonly a mistake caused when the knapper strikes a thin or weak margin of a biface.

Medial: Artifact mid-section. Artifact missing its proximal and distal ends.

Multifacet platform: Flake platform exhibiting more than one flake scar.

Natural platform: Flake platform covered with cortex.

Notch flake: Pressure flake whose platform is situated in a depression and is fan-shaped in plan-view. Flakes produced as a result of creating a notch.

Outre passé flake: Overpass or overshot flake. Flake with plunging termination on the margin opposite its initiation, usually on a biface or blade core.

Perverse fracture: Helical, spiral or twisted break initiated at the margin of a biface. This is a production error caused by inappropriate striking angle or excessive force loaded by percussion flaking into the margin.

Platform preparation: Alteration performed to ready a margin for the removal of flakes. This alteration is frequently achieved through abrasion or small flake removals along an edge or margin.

Potlid: Flake produced by heat-induced differential expansion as opposed to the flintknapping process. The flake has a flat dorsal surface and a convex ventral surface and is shaped somewhat like the inverted lid of a pot.

Preform: Unfinished artifact made from a blank. For analytical purposes, preforms are separated from blanks on the basis of the presence of pressure flaking scars.

Primary decortication: Removal of cortex from a piece of lithic material as the result of raw material testing and initial core reduction. These flakes have cortex over their entire dorsal surface.

Primary reduction: First stage of preparing lithic materials for reduction. Selection of raw material, core preparation, core reduction, and flake blank production are flintknapping activities considered to be primary reduction activities, debitage, and/or products.

Proximal: Haft element end of a projectile point or platform end of a flake.

Quarry blank: Any piece of lithic raw material transported from a quarry intended for future reduction.

Reduction technology: All of the techniques and strategies of a given flaked stone tool manufacturing and maintenance system.

Rejected: Formed artifact eliminated from the manufacturing or use-life trajectory prior to exhaustion because of some flaw or manufacturing error.

Rejuvenation: Reworking of unusable (worn or broken) artifacts into functional artifacts.

Retooling: Rejuvenation and recycling of lithic artifacts. Stone tool and general hunting equipment maintenance. Evidence of this activity may be present in the debitage as well as in the exhausted and discarded formed artifacts.

Secondary decortication: Latter stages of cortex removal from a piece of lithic material. Secondary decortication flakes have some cortex on their dorsal surfaces.

Secondary reduction: Production of functional tools from blanks and preforms.

Segregated reduction location (SRL): Area on, near, or forming an archaeological site where a knapper or knappers produced artifacts by flintknapping. An SRL exhibits debitage from a single flintknapping event.

Shatter: Cubical or irregularly shaped pieces of lithic material lacking the attributes of conchoidal fracture. Frequently associated with bipolar reduction.

Sheared cone: When a flake is struck too hard and the bulb of force is split in half from proximal to distal ends leaving the flake in two pieces.

Single facet platform: Platforms exhibiting a remnant of only one flake scar.

Tertiary reduction: All activities associated with the rejuvenation and retooling of formed artifacts.

Tested raw material: Lithic material tested for quality by flake removal.

Trajectory: Path within a model of a lithic reduction system that defines technological activities associated with stone tool manufacture and use while in systemic context: from selection of raw lithic material to deposition into archaeological context.

Unaltered raw material: Large, usable, and flakeable, but unaltered by knapping (not flaked), raw lithic material occurring in an archaeological context at an archaeological site.

Unifacial tool: Stone tool worked on one face or surface only.

Ventral: Surface of a flake corresponding to the interior of the artifact from which it was detached (exhibits attributes of fracture).

Workshop: Area on, near, or forming an archaeological site where lithic materials have been repeatedly and systematically reduced over an extended period of time by numerous flintknappers. Workshops are frequently associated with sites occupied for long durations and/or lithic source locations exploited extensively through time.

APPENDIX D: TECHNOLOGICAL CATEGORY ABBREVIATIONS
TECATS

FORMED ARTIFACT CATEGORY ABBREVIATIONS

(1) RM-Unalt:	Unaltered raw material
(2) RM-Test:	Tested raw material
(3) FC-NP:	Natural/cortical platform flake core
(4) FC-SF:	Single facet platform flake core
(5) FC-MF:	Multifacet platform flake core
(6) FC-MD:	Multidirectional/multiplatform flake core
(7) FC-BP:	Bipolar core
(8) FC-Exh:	Exhausted flake core
(11) B-CompDS:	Complete blank with detachment scar
(12) B-FragDS:	Blank fragment with detachment scar
(13) B-CompBT:	Complete blank made from a bifacial thinning flake
(14) B-FragBT:	Fragment of blank made from a bifacial thinning flake
(15) B-Comp:	Complete blank
(16) B-Frag:	Blank fragment
(21) P-CompDS:	Complete preform with detachment scar
(22) P-FragDS:	Preform fragment with detachment scar
(23) P-CompBT:	Complete preform made from a bifacial thinning flake
(24) P-FragBT:	Fragment of a preform made from a bifacial thinning flake
(25) P-Comp:	Complete preform
(26) P-Frag:	Preform fragment
(31) LP-Comp:	Complete lanceolate point
(33) LP-CompExh:	Complete exhausted lanceolate point
(34) LP-Prox:	Proximal fragment of a lanceolate point
(35) LP-Med:	Medial fragment of a lanceolate point
(36) LP-Dist:	Distal fragment of a lanceolate point
(41) DP-Comp:	Complete dart point
(43) DP-CompExh:	Complete exhausted dart point
(44) DP-Prox:	Proximal fragment of a dart point
(45) DP-Med:	Medial fragment of a dart point
(46) DP-Dist:	Distal fragment of a dart point
(51) AP-Comp:	Complete arrow point
(53) AP-CompExh:	Complete exhausted arrow point
(54) AP-Prox:	Proximal fragment of an arrow point
(55) AP-Med:	Medial fragment of an arrow point
(56) AP-Dist:	Distal fragment of an arrow point
(61) UF-Comp:	Complete unifacial tool
(62) UF-Frag:	Fragment of a unifacial tool
(71) FT:	Flake tool
(72) Perf:	Perforator
(96) Point-Dist:	Distal fragment of a projectile point
(97) Point-Med:	Medial fragment of a projectile point

FORMED ARTIFACTS, Continued

(98) NBF-Perc:	Nondiagnostic biface fragment with percussion flake scars
(99) NBF-Pres:	Nondiagnostic biface fragment with pressure flake scars
(1001) AF:	Anvil, flat top
(1002) AP:	Anvil, pitted top
(1003) AS:	Arrow shaft straightener/arrow shaft straightener fragment
(1004) ST:	Steatite artifact/steatite artifact fragment
(1005) TP:	Tarring pebble
(1010) GS:	Ground stone/ground stone fragment
(1011) M:	Mano/mano fragment
(1012) MH:	Mano/hammerstone
(1013) MHA:	Mano/hammerstone/anvil
(1014) ME:	Metate/metate fragment
(1015) P:	Pestle/pestle fragment
(1016) SB:	Stone bowl/stone bowl fragment
(1020) HS:	Hammerstone/hammerstone fragment
(1021) BI:	Battered implement/battered implement fragment
(1022) BT:	Bifacial tool/bifacial tool fragment
(1023) AB:	Abrader/abrader fragment

DEBITAGE CATEGORY ABBREVIATIONS

Stage 1: Core Reduction Debitage

100.PP:	Primary decortication flake with primary geological cortex platform
101.PI:	Primary decortication flake with incipient cone cortex platform
102.PC:	Primary decortication flake with a cortical platform
103.PS:	Primary decortication flake with a single facet platform
104.PM:	Primary decortication flake with a multifacet platform
110.SP:	Secondary decortication flake with primary geological cortex platform
111.SI:	Secondary decortication flake with incipient cone cortex platform
112.SC:	Secondary decortication flake with a cortical platform
113.SS:	Secondary decortication flake with a single facet platform
114.SM:	Secondary decortication flake with a multifacet platform
120.IP:	Early interior flake with primary geological cortical platform
121.II:	Early interior flake with incipient cone cortical platform
122.IS:	Early interior flake with a single facet platform
123.IM:	Early interior flake with a multifacet platform
125.IP:	Late interior flake with primary geological cortical platform
126.II:	Late interior flake with incipient cone cortical platform
127.IS:	Late interior flake with a single facet platform
128.IM:	Late interior flake with a multifacet platform
150.BP:	Bipolar flake

DEBITAGE, Continued

<u>Stage 2: Edge Preparation Debitage</u>

200.B+: Bifacial thinning flake with dorsal bulb remnant from parent flake
201.A-: Bifacial thinning flake with the characteristics of an alternate flake
202.A+: Bifacial thinning flake with the characteristics of an alternate flake and remnant detachment scar
203.E-:Bifacial thinning flake with the characteristics of an edge preparation flake
204.E+: Bifacial thinning flake with the characteristics of an edge preparation flake and remnant detachment scar

<u>Stage 3: Percussion Bifacial Thinning Debitage</u>

300.M-: Bifacial thinning flake with the characteristics of a margin removal flake
301.M+: Bifacial thinning flake with the characteristics of a margin removal flake and remnant detachment scar
302.E-:Early percussion bifacial thinning flake
303.E+: Early percussion bifacial thinning flake with remnant detachment scar
304.L-:Late percussion bifacial thinning flake
305.L+: Late percussion bifacial thinning flake with remnant detachment scar

<u>Stage 4: Pressure Bifacial Thinning Debitage</u>

400.E-:Early pressure bifacial reduction flake
401.E+: Early pressure bifacial reduction flake with remnant detachment scar
402.L-:Late pressure bifacial reduction flake
403.L+: Late pressure bifacial reduction flake with remnant detachment scar
404.N-: Notch flake from a bifacial preform (usually for a projectile point)
405.N+: Notch flake from a bifacial preform (usually for a projectile point) with remnant detachment scar
406.AC: Early pressure bifacial reduction alternate flake with cortex removed from tabular material
407.SP: Early pressure bifacial reduction secondary decortication flake with primary geological cortex removed from tabular material
408.ET: Early pressure bifacial reduction flake removed from tabular material
409.LT: Late pressure bifacial reduction flake removed from tabular material

<u>Technologically Nondiagnostic Debitage</u>

995.PL: Potlid
996.SH: Bipolar shatter
997.NP: Nondiagnostic flake fragment with primary geological cortex
998.NI: Nondiagnostic flake fragment with incipient cone cortex
999.NN: Nondiagnostic flake fragment with no cortex